



CIMIS California
Irrigation
Management
Information
System

Urban Resource Book

May 2000

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Foreword

Water agencies, resource conservation districts, and others often need to develop water management plans that incorporate efficient water management practices. Among such practices are preparing a water balance for the district or region, disseminating reference evapotranspiration data to growers and other water users, and making irrigation water management information available to growers and landscape managers.

This *Urban Resource Book* is one of two books that provide information on the California Irrigation Management Information System and other water management programs. The other is the *Agricultural Resources Book*.

This *Book* provides examples of how public and private agencies use CIMIS, which can be used to help prepare water management plans or on-farm irrigation scheduling programs. Information in this publication includes: CIMIS weather station sites, Department of Water Resources CIMIS personnel, public agency contacts, consultants, irrigation software, and publications that can be used in conjunction with CIMIS.

For further information on the CIMIS Program, contact Baryohay Davidoff, Chief, California Irrigation Management Unit, DWR, Division of Planning and Local Assistance, 1020 Ninth Street, Sacramento, California 95814; (916) 327-1788. For general information on CIMIS and other publications, please call (916) 653-1097.

William J. Bennett, Chief
Division of Planning and Local Assistance

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Introduction

The California Irrigation Management Information System (CIMIS) has been operating successfully since 1982. This *Urban Resource Book* provides comprehensive information for the whole program and puts all resources regarding urban uses of CIMIS into one publication.

The book is intended for anyone who needs to develop a water management program for a local agency or disseminate irrigation management information; water suppliers who provide help and assistance to customers; private consultants who provide irrigation scheduling and management services to commercial and residential landscape, park, and golf course managers; and home owners.

About This Book

Developing an irrigation plan can be daunting, especially if you are new to CIMIS or to the concept of irrigation scheduling. What is available in this book:

Steps to establishing a CIMIS-based irrigation program: Three basic steps are provided to help you start a successful CIMIS-based irrigation management program.

Examples of how others are using CIMIS: These examples will provide some insight into how CIMIS can be used and allow you to choose or modify one or a combination of existing programs to suit your resources. The names, addresses, and telephone numbers of contacts are provided at the end of each example.

Basic CIMIS information: CIMIS weather station sites and addresses and telephone numbers of appropriate Department of Water Resources personnel are included in this section. You will be able to locate the nearest appropriate weather station and contact person to help you with any CIMIS-related questions. Also included in this section are the CIMIS data dissemination points such as radio stations, telephone recordings, web sites, and newspapers.

Public Agency Contact: A list of State and local government contacts such as county cooperative extension office addresses and telephone numbers are included here.

General information: Lists of irrigation scheduling software, irrigation consultants, irrigation mobile laboratories, and irrigation training are included in this section.

Publications: Many publications that can be used in conjunction with CIMIS are listed. These include University of California Cooperative Extension, local agency, and DWR publications.

The resources and examples provided here will help you to choose what action may be appropriate to your particular situation. At any step of your work, staff from the Department of Water Resources are available to help you. You may reach CIMIS staff at the phone numbers listed on pages 39-40.

What is CIMIS?

CIMIS, the California Irrigation Management Information System, is an integrated network of more than 100 computerized weather stations located at many agricultural and urban sites throughout California. The names of current and historical CIMIS weather stations and a map showing the location of current weather stations are in the "Basic CIMIS Information" section. CIMIS, which is operated by the California Department of Water Resources, helps agricultural growers and park, golf course, and other landscape managers develop water budgets to determine when to irrigate and how much water to apply. The primary use of the CIMIS system is to provide information for improving water and energy management through efficient irrigation practices.

Weather data are collected from each weather station in the network and transferred to a centralized computer in Sacramento. After being analyzed for accuracy, the data are used to estimate soil evaporation and the amount of water used by the irrigated grass (transpiration) around the weather station. The combined value of estimated grass water use and soil evaporation is referred to as "reference evapotranspiration" or ETo. The ETo data is then stored in the form that is available when the computer is called.

Changes in ETo can be used as a guide to changes in crop or landscape water use over time. By using crop coefficients (Kc) and ETo, actual water use can be estimated with a fair level of accuracy. These Kc values have been developed for many trees, vines, agronomic crops, grasses, vegetables, and landscapes. They are available in UC Cooperative Extension publications that can be obtained from DWR (see "Publications" section of this *Urban Resource Book*).

Weather Station Siting Criteria

Many local agencies want to buy, install, and connect weather stations to the CIMIS network. A weather station site can affect the accuracy of ETo. With the help of the University of California, DWR prepared criteria to help these agencies find and judge prospective sites for CIMIS weather stations.

Buildings or trees close to a weather station can affect wind speed data, which in turn affects the estimated ETo. The absence of healthy green grass around a weather station affects humidity, which will adversely affect ETo. Bare soil instead of cropped grass around the station can increase advective energy, resulting in increased temperatures and decreased humidity, which in turn increase the ETo value.

A CIMIS weather station's location should represent the largest possible surrounding area. The grass at the site should be well maintained, properly irrigated and fertilized, and mowed or grazed frequently to maintain a height between 10 to 15 centimeters (4 to 6 inches).

Regional and Local Criteria:

Site the station within the region it is meant to represent.

Locate the station in an area with a distinct climate, not in a transitional area between two regions of distinct climates, unless you are attempting to characterize that transitional area.

Site the station away from topographic depressions, as the temperature there is frequently higher during the day and lower at night. High points should also be avoided in most cases.

Make a long-term commitment to maintain the same land use in and around the site, to avoid moving the station in the future.

Surrounding Environmental Criteria:

Site the station away from wind obstructions within 90 meters (100 yards) of the site. Choose a site that has no linear obstructions, such as buildings or windbreaks, within 137 meters (150 yards) perpendicular to the direction of the prevailing wind.

Place the station at a distance from fields where there are frequent crop rotations, because the fields will have bare soil between crops.

Site the station away from abrupt crop/vegetation changes (i.e., pasture to row crops) within 45 meters (50 yards) of the site, or 90 meters (100 yards) upwind of the site.

CIMIS Cooperators

Although CIMIS is managed by the California Department of Water Resources, most of the stations are owned or maintained by the following local organizations.

Alameda County Water District	Mojave Desert Resource Conservation District
Apple Valley Resource Conservation District	Monterey County Water Resources Agency
Arvin-Edison Water Storage District	Napa County Resource Conservation District
Blythe Resource Conservation District	North Marin Water District
California State University	Orange Cove Irrigation District
Calleway Vineyards	Otay Water District
City of Petaluma	Palo Verde Irrigation District
City of San Diego	Panoche Water District
City of Santa Cruz	Paramount Farming
City of Santa Rosa	Plantscience, Inc.
Coachella Valley Resources Conservation District	Richard Rodoni
Coachella Valley Water District	Sacramento Area Water Works Association
Contra Costa Resource Conservation District	San Benito County Water District
Cuyama Valley Resource Conservation District	San Diego Gas & Electric
Driscolls Strawberries	Santa Clara Valley Water District
East Bay Municipal Utility District	Shenandoah Valley Grape Growers Association
Goleta Water District	Solano County Water Agency
Hi-Lo-Golf	United States Bureau of Reclamation
Imperial Irrigation District	United States Department of Agriculture
Madera Irrigation District	United Water Conservation District
Marin Municipal Water District	University of California
Merced Irrigation District	Valley of the Moon Water District
Metropolitan Water District of Southern California	Windsor Water District

How to Get CIMIS Information

You can access the CIMIS computer through a dial-up service or the Internet. The dial-up service is available by a toll-free telephone call. However, a USER ID and password are required. On the Internet, CIMIS data is available via Telnet, FTP, and the World Wide Web.

Most network packages and operating systems have a Telnet program; a valid USER ID and password are required. The CIMIS Telnet host name is **aviion.water.ca.gov**. You can access daily data for the past seven days and monthly data for the last twelve months through FTP. Text files containing data, grouped by county, are deposited daily on the CIMIS FTP site. A USER ID and password are not required; you can log on to the CIMIS FTP site with an anonymous username and your e-mail for a password. On the World Wide Web, CIMIS data is available at:

CIMIS: **www.dpla.water.ca.gov/cimis.html**

Statewide IPM Project, University of California: **www.ipm.ucdavis.edu**

Wateright: **www.wateright.org**

CIMIS information is also available statewide from local water agencies, farm advisors, newspapers, radio stations, and industry publications. Several consultants also use CIMIS data to provide services to growers, golf courses, and parks.

Further information or assistance on CIMIS can be obtained from DWR CIMIS staff. A list of CIMIS personnel is given in the "Further Information Sources" section starting on page 35.

Establishing a CIMIS Irrigation Management Program

Three basic steps for establishing such a program are outlined below. The resources and information required are available in this *Urban Resource Book*.

Step One : Designate a Staff Person

The first step is to designate a staff person who will be responsible for the program. The person will be a liaison between your agency and other agencies such as DWR, Cooperative Extension, and the media. If the person needs training in basic irrigation concepts, training classes and seminars are offered by various institutions (refer to the "Training Information" section). Information on CIMIS workshops can also be obtained from DWR CIMIS staff shown in the "Public Agency Assistance" section.

Step Two : Retrieve CIMIS Data and Disseminate

Retrieve ET data from any of the web sites listed in the "How to Get Info" section and disseminate. You can also link to the CIMIS web site from your agency web site.

At this point, it is probably a good idea to alert irrigation water users in your area that you will be disseminating ET data. Local news media, leaflets, and your own agency newsletter, web site, or water bills are some of the ways to publicize availability of data. As an example, a rolodex card from the Mission Resource Conservation District (Figure 1) advertising availability of ET data is shown below.

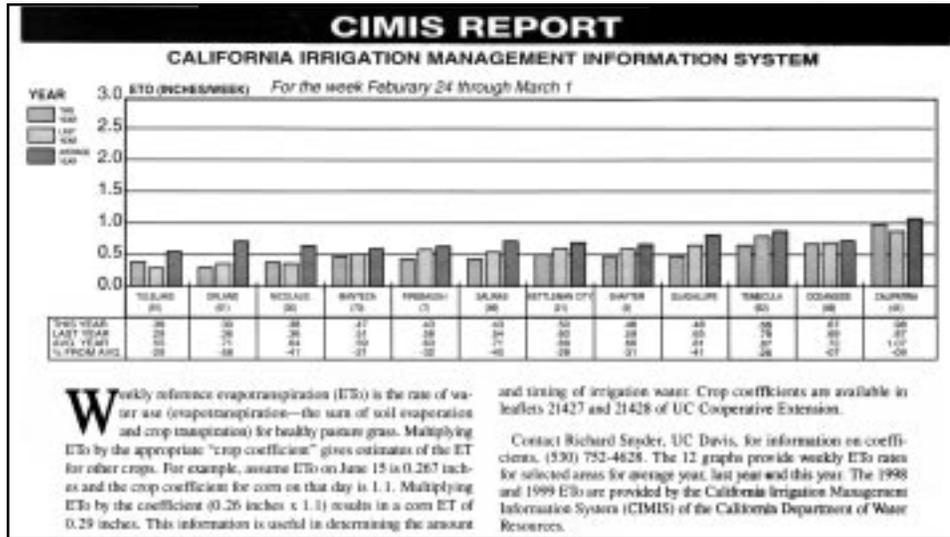
Figure 1



Newspapers, newsletters, radio, television, web pages, and telephone recording systems can help you disseminate the information. This publication's sections on "Examples" and "Basic CIMIS Information" contain examples of data dissemination sources. Two actual CIMIS data dissemination examples are given on pages 6 and 7. Figure 2 is extracted from the California Farm Bureau Federation's *Ag Alert* newspaper. Figure 3 is a copy of a fax

sheet distributed by Imperial Irrigation District. Since CIMIS disseminates reference ET data only, the local farm advisor can help convert the data to a specific crop water use number. At the same time, you should make plans not only on how to disseminate the information, but also on how to use it. The "Examples" section of the publication starting on page 9 may be helpful in deciding how to use the data.

Figure 2

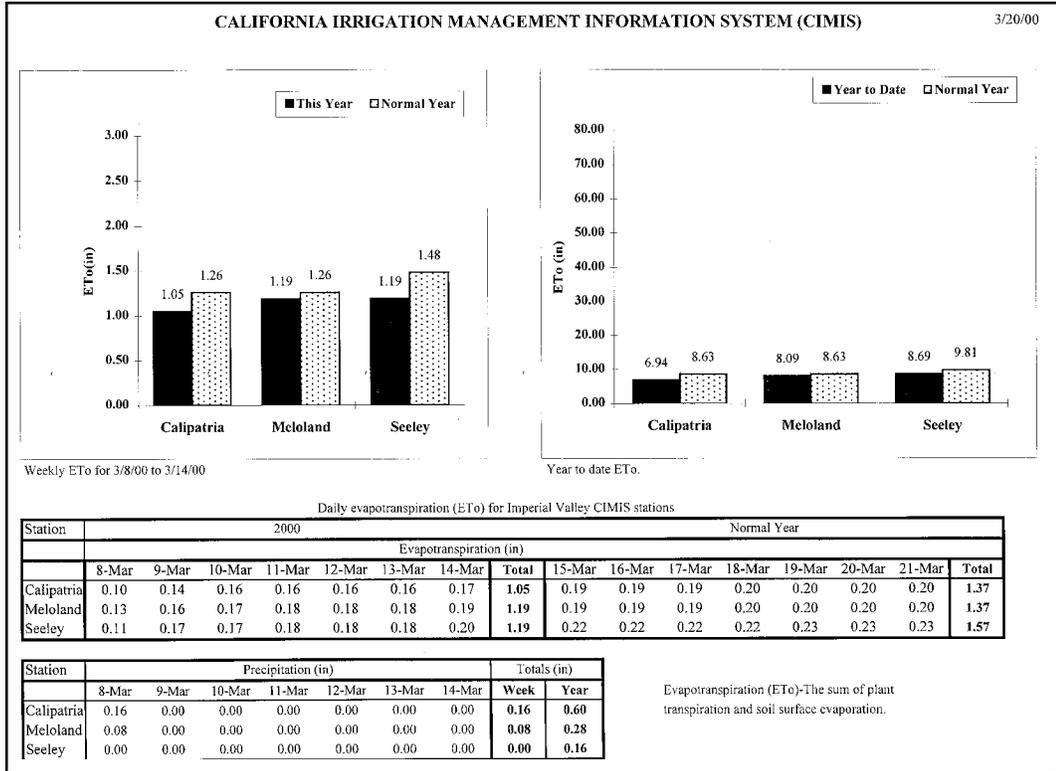


Step Three : Implement and Promote the Program

The final step is the public assistance and implementation step. While some people may know how to use CIMIS ET data for scheduling irrigations, others may need assistance. Appropriate agencies to work with include the local farm advisor, USDA - Natural Resources Conservation Service, and irrigation consultants for assistance on appropriate coefficients and on the use of the ET data. It may be helpful to organize workshops or training sessions for your water users.

These steps are not the only ways to implement a program. You may also read through the "Examples" section and see what has been tried by other agencies. If any look appropriate to your particular situation, call the person listed at the bottom of the page under "For Further Information" to obtain more specifics. While considering the resources available to you, adapt your selected methodologies described in the "Examples" section to develop feasible plans with assurance that the general principles have worked in the past and will probably work for you.

Figure 3



Examples

The following examples describe successes of agencies and communities using CIMIS. Their situation may suggest an alternate way of approaching a common problem.

Irrigation Scheduling on the Web

You can now develop an irrigation schedule guide for turf and agricultural crops through the World Wide Web, using a new program called Wateright, which is located at www.wateright.org.

The program was developed by the Center for Irrigation Technology, with significant support from the U.S. Bureau of Reclamation. Wateright is linked to CIMIS ETo data for specific sites in California. The program references the CIMIS weather stations to develop site-specific irrigation scheduling guidelines for California.

Wateright is an educational tutorial about weather-based irrigation scheduling that also provides irrigation schedule guidelines for local sites. The tutorial uses animation and text to educate the user on weather-based irrigation scheduling principles and practices, serving homeowners, turf/landscape professionals, and farmers.

You can develop an irrigation-scheduling guide by answering a few field-specific questions. If you don't know the specifics for an irrigation system, you can print out a questionnaire to help you. The questions cover your irrigation system and equipment, soil type, crop selection, planting date (annuals), etc. Fill out the questionnaire before you create the scheduling guide. Wateright provides some default values for management-allowed depletion (MAD), distribution uniformity (DU), or scheduling coefficient (SC) as starting points to develop your own irrigation-scheduling guidelines.

The next step is to select a nearby CIMIS station, which is the reference for establishing your irrigation schedule guide. Select the appropriate county and choose the nearest or most representative CIMIS station within that county. Since weather conditions create plant water demand, select a reference which is similar to your site.

Five-year historical data is used to develop an irrigation guide. Wateright compares the historically-based irrigation guideline with current weather data and notes any run times that are significantly different than current weather conditions predict. Use the scheduling guide to compare it to current practices so you can explore any major differences between the two.

Wateright walks you step-by-step through the process. The program was designed so anyone, even someone with little or no irrigation experience, can learn about weather-based irrigation scheduling and develop an irrigation-scheduling guide on the first visit to Wateright.

As with all weather-based irrigation-scheduling guides, actual irrigation requirements should be verified by observing plant material and verifying soil moisture levels. Waterright provides a site-specific adjustment of the initial run-time estimates for each field you entered. The original estimates are set at 100 percent. You can customize each field or area between 50 to 150 percent by using a dropdown box. Adjust the field each time guidelines are generated to reflect the water requirements of your crops.

A comment section is available, and Waterright welcomes your comments.

For further information, contact David Zoldoske, Center for Irrigation Technology, California State University Fresno, 5370 North Chestnut Avenue, Fresno, California 93740-0018; (559) 278-2066.

City of Fremont's Formula for Reducing Irrigation Water Consumption

The City of Fremont is the largest single water user in the Alameda County Water District, irrigating over 200 acres of turf, shrubs, and ground cover in 40 parks. ACWD makes CIMIS data accessible by telephone, local newspapers, and other public outlets. In 1992, the City of Fremont developed a water conservation plan using available CIMIS data, in conjunction with a new sprinkler control system. In order to be effective, this system would need:

- a method of quickly, simply, and accurately resetting controller irrigation times to deliver precisely the amount of water dictated by current weather conditions.

- If the process isn't easy, it won't get done;

- the ability to stop or prevent watering when rain is expected or when it is actually raining; and

- the ability to instantly turn off controllers that are watering.

In fall 1992, the city installed 58 percentage control adaptors in 33 of its parks and 22 units on medians. Percentage control was implemented in 1993. Irrigation water consumption in 1993 was 59 percent of 1990 consumption, a reduction of 41 percent. In 1994, the city won first place in the statewide Water Awareness Campaign, sponsored by several government entities and four major water districts.

In 1995, 10 Fremont parks were studied to compare 1994 weekly consumption with that of 1990. The total irrigated area of the 10 parks is 35 acres, 80 percent in turf and 20 percent in shrubs and groundcover. Total consumption for the 10 parks in 1990 was 54,372 HCF. In 1994, the consumption from water meter records was 34,401 HCFs, a reduction of 19,971 HCF, or 37 percent less than 1990 consumption.

For the 10 parks, the annual net savings after the required communication fee was \$14,000; the installed cost of the 12 percentage control adaptors was \$20,600, a 68 percent rate of return on investment.

For further information, contact Eric Cartwright, Alameda County Water District, 43885 South Grimmer Boulevard, Fremont, California 94538; (510) 659-1970.

CIMIS ETo Zone Map-based Irrigation

Did you know you can use the CIMIS ETo zone map to develop a "normal" year turf irrigation schedule? As an example, calculate some numbers for the month of May.

ETo zone: 9

Precipitation rate: 1.5 inches/hour

Distribution uniformity: 70 percent (0.7)

Irrigation rate: every third day

Grass: cool-season turf grass

Time frame: May through October

For ETo zone 9, the average ETo for May is 0.19 inches per day. Since you irrigate every three days, the ETo will be 0.57 inches every three days.

Your turf ET is calculated as: $ET = ETo \times Kc$. We will use a turf Kc of 0.96 for May, then $ET = 0.57 \times 0.96$ or 0.55 inches.

The actual depth of water to be replenished is 0.55, divided by the distribution uniformity (.70). It comes to 0.78 inches for each irrigation.

The run time is calculated as inches to apply, divided by system precipitation rate.

For example:

$$= \frac{0.78}{1.5} \times 60 = 31 \text{ minutes each irrigation}$$

Note that 60 is used to convert the precipitation rate from hours to minutes. By using the same procedure, we get the following table (Figure 4):

Figure 4

Month	ETo (inches/day)	3-day ETo	Kc†	ETc (inches)	ETc/DU	Run time per irrigation (minutes)
January	0.07	0.21	0.67	0.14	0.20	8
February	0.10	0.30	0.67	0.20	0.29	11
March	0.12	0.39	0.67	0.26	0.37	15
April	0.17	0.51	0.96	0.49	0.70	28
May	0.19	0.57	0.96	0.55	0.78	31
June	0.22	0.66	0.96	0.63	0.91	36
July	0.24	0.72	0.85	0.61	0.87	35
August	0.22	0.66	0.85	0.56	0.80	32
September	0.19	0.57	0.85	0.48	0.69	28
October	0.13	0.39	0.68	0.27	0.38	15
November	0.09	0.27	0.68	0.18	0.26	10
December	0.06	0.18	0.68	0.12	0.17	7

† Richie, W. E., R.L. Green, and V.A. Gilbeault. 1997. California Turfgrass Culture, Vol. 47, Nos. 3 & 4.

This table does not account for rainfall. Rainfall should be factored when calculating run time. Also, the table is based on average (normal) weather conditions. Deviations from average weather conditions can be monitored and adjustments made by observing current CIMIS ETo data.

For further information, contact Simon Eching, Department of Water Resources; (916) 327-1836, or visit the CIMIS Web site at www.dpla.water.ca.gov/cimis.html.

Telephone Access to CIMIS Information

The Mission Resource Conservation District first became involved in the field of irrigation water management in 1983 when it started using one of the first DWR-sponsored Mobile Irrigation Laboratories. The program was joined in 1990 by a Large Landscape Turf Water Management Program and an Agricultural Water Management Program.

As a further supplement to the District's irrigation water management outreach in San Diego County, MRCD set up an "800" CIMIS information line in 1990. This toll-free line provides access to ETo data from five local CIMIS stations. This includes four coastal area stations (#49 at Oceanside, #66 at San Diego, #147 at Otay Lake, and #150 at Miramar) and two inland area stations (#62 at Temecula and #153 at Escondido SPV).

Mission's 800 line can easily be duplicated by other agencies with an interest in disseminating CIMIS information. Many phone companies and local businesses offer voice mail box services at reasonable prices. If one or two stations are being reported, a single mail box will do. If a large number of stations are reported, or if you wish to supplement ETo data by giving weekly averages, for example, multiple mail boxes will allow you to select the particular station you need without having to listen to information from stations you don't want. Other mail boxes on the line can be used to explain how to use CIMIS information, announce upcoming events, etc.

Mission's system is currently set up using four voice mail boxes. Box number one contains a greeting and directions on how to access the other mail boxes. Box number two reports ETo data for the four coastal climate stations. Box number three reports ETo data for the two inland climate stations. Box number four is an auxiliary box. In the past, MRCD has used this mail box to conduct a survey on who was using the 800 line and to announce upcoming irrigation related meetings and events. Currently, box number four contains a brief explanation of the CIMIS system.

Response to the 800 line has been good. Call totals range from roughly 50 per month during the winter to over 300 per month during the summer. Phone bills from the 800 number are reported in totals for daytime rates, evening rates, and night rates. Thus, MRCD is not sure who is using the service or exactly how often they are calling. However, when occasional problems with the mail service or our 800 carrier are encountered, the office is flooded with requests for CIMIS information. Although this may be a bit of an inconvenience, it is gratifying to know that growers and landscapers depend on the service.

For further information, contact Judy Mitchell, Mission Resource Conservation District, 1181 East Mission Road, Fallbrook, California, 92028; (619) 728-1332.

School Retrofit Conservation Program

Since the beginning of 1990, the Escondido Union School District has put emphasis on reducing the water use on district school grounds. Since 1989 the district has reduced water consumption 30 percent at its 18 schools. This success is attributed to the grounds supervisor and grounds maintenance crew.

Local irrigation and water conservation experts were consulted the beginning of 1990. Next, the Mission Resource Conservation District performed irrigation evaluations and furnished irrigation schedules based on CIMIS weather data.

The problem was then approached three ways: scheduling irrigations, retrofitting irrigation systems, and improving cultural practices. Irrigation scheduling was the easiest of the three to implement. The amount of water that was being applied historically was calculated and the weather was watched closely. Many times water was cut back with little impact to the turf.

A total of 32 million gallons of water per year have been saved. This works out to a \$40,000 reduction in Escondido Union School District's annual water bill—direct savings to the tax payer!

For further information, contact Chris Bunnell, Escondido Union School District, 150 West Lincoln Avenue, Escondido, California, 92026; (760) 432-2421.

Water Savings with Central Irrigation Control System and CIMIS

With a new central irrigation control system from Network Services Corporation, Petaluma, California, and data from the California Irrigation Management Information System, Union City has reduced the amount of water used to irrigate six city parks by 35 percent within one year—saving \$12,000 annually.

With the new system and CIMIS data, grounds maintenance personnel can adjust irrigation controllers to replace the exact amount of water lost through soil evaporation and plant transpiration (known as evapotranspiration or ET). To do this, maintenance personnel acquire ET values on a weekly basis and use the information to determine how much water to apply. (ET is estimated by a network of weather stations located throughout the State. CIMIS maintains this network and provides a means of accessing the data.)

By telephoning a toll-free number and entering commands on a phone keypad, the irrigation instruction is broadcast to the adapter units through a satellite-based communications system. The message can be sent to an individual adapter, to a group of adapters at one park, or to all adapters in the city with just one phone call.

Part-to-park comparisons were made in the same time period. Adapters were installed in six parks in May through June 1991, irrigating a total of 18 acres of turf and shrubs. Water used per acre in the parks with adapters was compared to water used per acre in the parks without adapters over a four-month period.

The amount of water saved in the six parks with adapters over the four-month period was 4.2 million gallons (or 234,000 gallons per acre). Savings per acre ranged from a low of 27 percent to a high of 40 percent (comparing like parks). The average water savings is 35 percent.

Year-to-year comparisons were also made between 1990-91 and 1991-92. Annual savings resulting from adjusting water applications in response to weather conditions was about 9 million gallons, a savings of \$12,000. The cost of the central irrigation control system was \$10,700. The system communications cost for one year was \$1,590.

In addition to the new irrigation control system and CIMIS information, the city used other measures to reduce water purchases, including tank trucks to irrigate medians with “re-cycled” water from a waste treatment plant. The total reduction in water purchases was about \$28,000.

For further information, contact Phil Sachs, 34009 Alvarado-Niles Road, Union City, California 94587; (510) 471-3232, Ext. 355.

Nursery Uses Work Force to Reduce Water Use and Expenses

Conservation is nothing new at Yoder Brothers Nursery. In the 1970s the 20-acre nursery near Chualar reduced its electricity use by 33 percent and its natural gas use by 78 percent. Without these ongoing energy saving measures, Yoder's energy bills would be four times what they are today.

Five years ago, the general manager observed water flowing off the nursery property and thought "in the midst of a drought, we have to do a better job saving water."

With that, he began to monitor the run-off flow and develop plans to reduce it. Real savings came with the implementation of the nursery's conservation plan in 1990.

The success of Yoder's conservation program can be attributed to involving the entire work force at the nursery. Yoder is continually trying to keep all employees fully aware of saving water on the job as well as at home. Every day as employees arrive at work, greeting them is a banner, "Saving water is everyone's job." Next to the banner is a graph showing monthly water use at the nursery this year vs. previous years. In the past four years, Yoder Brothers has achieved water savings of 44 percent.

Not only is total water use recorded, but it is also compared on a "per production area" basis. This allows Yoder to document total savings and to verify the increases in water use efficiency. For example, total water usage in 1989 was 52 million gallons (160 acre-feet) or 117.3 gallons per square foot of production area.

The water savings can be attributed, in part, to innovative irrigation technologies including gantries (which are similar to a mini-linear move machine), but most of all, it is the "people involvement" that makes the nursery's conservation programs so successful. Most important is an awareness on the part of the direct user, the irrigator. But staff at the nursery believes that this must begin with a commitment from the top to train employees.

For further information, contact Tom Harcharick, Yoder Brothers Nursery; (408) 424-0613.

Budgets in Paradise

The following is a personal case study by John A. Basanese, who was with Arcadia Management Services, San Jose.

When I took a new job as the “in-house” landscape supervisor of a group of large apartment complexes in San Jose, I knew that water management would be an important part of my job. The endless supply of cheap water that turned a California desert into a garden was now about to be held to a budget! The drought was continuing year after year and fines for excessive use were coming into effect. As a new supervisor, I wanted to reduce water use, and cut costs for water while maintaining an attractive landscape. Our water supplier chose to limit its customers to 80 percent of the 1987 use. If this limit was exceeded, a fine would be assessed.

So the first step was to find out what the water use for 1987 was and simply use less. Past bills in our case showed the history for the last 12 months. All I had to do was to find a bill for December 1987 and read the water use month by month for the year. This was a little difficult, since there are over 30 meters for the whole site. Seven of these meters are for landscape only. I had to find the landscape meters in the field, read the meter ID, match it with the bill (which has a different ID), and then divide a site map into zones covered by each meter. For this process, I had to call the water supplier several times. They were very helpful. They explained how to read the meters and how to convert “hundreds of cubic feet,” or “ccf” to gallons. I found that each unit of usage was 100 cubic feet (748 gallons) and that one unit costs \$1.32. Total 1987 use for our 8 acres of landscape was 20,182 ccf, which cost \$26,640.

Once I had the history for each landscape meter, I could display the data to see the pattern of use. I made up a line graph with the monthly totals for each zone and then one for the sum of all seven meters. This provided a graphic picture of the pattern of past use. The use was, as I expected, very high in the summer and low in the winter. However, the peaks and dips showed an overall erratic pattern. I could picture what those peaks were caused by: stuck valve, broken mainlines, misprogrammed controllers, vandalism, system checks, etc.

I was determined to develop a management strategy that would limit these wasteful peaks and smooth out the curve. We stopped all watering on weekends, tested all valves before the restart in spring to find any valves that had a tendency to stick at the “on” position, and informed security personnel about where to turn off the systems in the event of a mainline break. The morning after an irrigation, we would check quickly through the site to make sure all valves had shut down. Crew involvement was very important, and I feel they played the most important role in the actual savings of water that we realized.

At this point, I requested that the water bills be sent to me so that I could see how well we were doing. This was not very satisfactory, since they arrive only once a month (much too late to correct problems), and they are not read on a consistent day. To do better, we began to read the meters ourselves every Friday. This weekly reading was entered into a running log and then transferred onto a bar graph. Though this involved some extra time, the benefits were

amazing. We now knew the actual volume of water used. We had weekly feedback on the effect of our management programs. I used the graphs as a motivation for my crews to keep reducing water use. For example, a “run away” valve really showed up like a “sore thumb” as the bar shot up above the average. By comparing the total for each month with past bills, I could see that we were well on our way to very substantial savings.

The next step was to find out how we were doing in relation to actual plant needs. It’s great to do better than the past, but the question still remained: “How low can we go?” This is where the University of California Cooperative Extension horticultural advisors and records from CIMIS came into play. During attendance at turf seminars, I found that there is a standard of plant water use that is determined for geographical areas as well as seasonal weather changes. This standard is called the “evapotranspiration rate.” By knowing this rate for each month, you can approximate how much water, in inches of precipitation, a landscape planting would need. This ETo rate was generated from many CIMIS weather stations located in different cities. Historical data on average ETo for any area was written up in UC Cooperative Extension and California Department of Water Resources publications. All I had to do was take this data and apply it to my sites. I found that for my site the rate is 45.5 inches per year. The monthly figures helped me to divide that amount into inches per month.

Knowing that the amount of 45.5 inches is the reference ETo, and that most plants and turf can get by with 50 percent to 80 percent of that amount, I used the Model Water Efficient Landscape Ordinance (AB 325) formula and figured that my site should use 80 percent of ETo. So, finally, I had a standard, ballpark figure for the volume of water my 8-acre landscape would need.

$$\frac{(80\% \text{ ETo}) (\text{total area in ft})}{12 \text{ in/ft} \times 100} = \frac{.80 \times 45.5 \text{ in.} \times 43,560 \text{ sq ft/ac} \times 8 \text{ ac}}{1,200 \text{ in/ft}} = 10,571 \text{ ccf}$$

This figure has given us something more realistic to shoot for. And in the past several years, we have actually come in below it with an average of about 9,000 ccf per year. This represents a financial savings of over \$10,000 per year on this site! I feel that if we could use the actual weekly CIMIS data, we could do even better. The lack of an office computer makes it difficult to access the CIMIS data currently; however, I hope to soon be hooked up to this valuable information line.

Since starting this program, I have performed water audits, used low water use plants, fine-tuned my systems, and updated some old controllers. I also developed a complex spreadsheet to integrate all aspects of a water management program. However, nothing will save as much as what I accomplished through the following three steps:

- Know the past use.
- Track current use with landscape meters.
- Use local ETo rates to set up realistic goals.

For further information, contact John A. Basanese, Applied Water Management Services, 1160 Arapaho Drive, Gilroy, California 95020; (408) 848-3649.

Saving Water Through Forecasting and Technology

In 1994, responding to needs of the growers, Coachella Valley Water District began to provide office space for a one-person, half-year, weather forecasting operation. The primary purpose was to warn growers, through weather forecasting and communications, of impending frosts and freezes. National Weather Service supplied a meteorologist for six months each year through the colder months.

To assist farmers in getting timely local weather and frost forecasts, the District installed telephone equipment to provide around-the-clock recorded forecasts and installed a weather radio station which beams signals throughout the area from CVWD's headquarters.

In 1987, the Association of Golf Course Superintendents bought a weather station which was installed as part of CIMIS by the Coachella Valley Resources Conservation District and the College of the Desert.

To help publicize the new weather station and make evapotranspiration information more familiar and available to the golf industry, CVWD asked a long-time local meteorologist to add daily ETo to his forecast. As a result, the number of calls to the recorded information messages over the past six years has doubled to 8,000 calls per month.

Records of some golf courses show dramatic reduction in water use. In 1992, 16 golf courses set new individual records of reducing water use during the previous 12-month period.

For further information, contact Dave Harbison at Coachella Valley Water District, Post Office Box 1058, Coachella, California 92236; (760) 398-2651, Ext. 541.

Basic CIMIS Information

The following sections contain current and historical CIMIS weather station sites and station locations (pages 32 and 33), lists of agencies, local access points, and regional access points for obtaining CIMIS information.

Local Access Points for CIMIS ETo Information

The Department of Water Resources is encouraging local dissemination of CIMIS ETo information. Below is a list of radio stations, newspapers, local agencies, and universities that are currently providing CIMIS ETo information. If you are aware of any changes to these sources, please contact Simon Eching at 1-800-922-4647.

Alameda County

Station 100
Argus Newspaper
Main Switchboard
(510) 661-2600
Weekly ET on Saturdays

Station 100
Alameda County Water District, Fremont
(510) 659-1970 Ext. 220

Station 65
East Bay Municipal Utilities District, Oakland
(510) 287-1903 *

Butte County

Station 8
Butte County Chico Enterprise Record, Chico
(530) 891-1234
Weekly ET for pasture/turf, alfalfa, olives, orchard—three clean tilled
leafing dates and one for grass cover crops, beets, corn and grain.

Station 8
Gridley Herald, Gridley
(530) 846-3661
Weekly ET for 11 crops.

Contra Costa County

Station 47, Station 65
Contra Costa Water District, Concord
(925) 688-8136
No recording. They will fax information to you.

Fresno County

NOAA Weather Radio Station

Fresno, 162.400

CIMIS ETo information can be heard weekdays, March through October, during the agricultural weather advisory report.

Station 7

Firebaugh-Mendota Journal, Firebaugh

(559) 659-3057

Station 39

AgLine, Kings River Conservation District

(559) 237-4800*

The information is on ETo and ETc for trees, vines, field and row crops, and other crops and is prepared by Kings River Conservation District.

Imperial County

Station 41, Station 87

National Weather Service Forecasting, Imperial

(760) 352-3360*

ETo for Imperial Valley

Station 41, Station 68, Station 87

Imperial Valley Press, El Centro

(760) 337-3400

Station 41, Station 68, Station 87

Imperial Irrigation District, Imperial

(760) 339-9082

Provides weekly ETo

Kern County

NOAA Weather Radio Station, 162.550 MHz, Bakersfield

CIMIS ETo information can be heard weekdays, March through October, during the agricultural weather advisory report.

Kings County

Station 2, Station 15, Station 21

Hanford Sentinel, Hanford

(559) 582-0471

Los Angeles County

Station 78

KIEV 870 AM, Glendale

Garden show on weekends hosted by retired farm advisor (7 a.m. Saturdays; between 5 a.m. - 7 a.m. Sundays).

Station 82

Claremont Courier, Claremont

Marin County

Station 63
Marin Municipal Water District, Corte Madera
(415) 945-1579*

Station 63
North Marin County Water District, Novato
(415) 892-1418, Ext. 555*

Merced County

Station 7, Station 56
Dos Palos Star, Dos Palos

Station 56, Station 70
Gustine Standard, Gustine

Station 7, Station 56
Los Banos Enterprise, Los Banos
(209) 826-3831

Modoc County

Station 43, Station 90
KCNO 570 AM, Alturas
(916) 233-3570
ET information is presented during the agricultural broadcast (6 a.m. and 12:30 p.m.)

Station 43, Station 90
Modoc Record, Alturas/Cedarville
(916) 233-2632

Riverside County

Station 129
KKIG 780 AM, Coachella
The information is broadcasted during the weather forecast.

Station 135
National Weather Service Forecasting
(760) 398-7211*

Station 118, Station 136, Station 141
Coachella Valley County Water District, Coachella
(760) 398-7211*
ETo for Coachella Valley.

Station 44, Station 62, Station 78, Station 137
Riverside Corona Resource Cons. District, Riverside
(909) 683-7691

Station 44
Western Municipal Water District, Riverside
(909) 780-2809*

Sacramento County

Station 13
KSTE 650 AM, Sacramento
(916) 576-1578
ET is presented during the Sunday morning garden show.

Station 13
KRAK 1140 AM, Sacramento
Information is presented on agricultural weather with ETo for Sacramento and San Joaquin Valley (7 p.m. Monday through Friday).

NOAA Weather Radio Station, 162.550 MHz, Sacramento
CIMIS ETo information can be heard weekdays, March through October, during the agricultural weather advisory report.

Station 131
Citrus Heights Water District/Fair Oaks Water District/San Juan Water District/
Orangevale Water Company, Citrus Heights
(916) 725-1713*

San Benito County

Station 126, Station 143
San Benito County Water District, Hollister
(831) 637-8218*
Jeff Ray provides weekly ETo

San Bernardino County

Station 117, Station 134
Mojave Desert Resource Conservation District, Hollister
(760) 261-3346* Victorville
(760) 261-3326* Barstow

San Diego County

Station 153
Fallbrook/Bonsall North County Times, Fallbrook
(619) 728-6116

Station 49, Station 62, Station 66, Station 147, Station 150, Station 153
Mission Resource Conservation District, Fallbrook
1-800-339-9954* within area

Station 49, Station 62, Station 66, Station 153
UC Cooperative Extension, San Diego, San Diego
(760) 745-2215*

San Joaquin County

Station 42, Station 70
Lodi News Sentinel, Lodi
(209) 369-2761

Santa Barbara County

Station 64, Station 88, Station 120
KSNI 102 FM, Santa Maria
(805) 925-2582
Information aired during agricultural forecast (6 a.m., noon, and 5 p.m.)

NOAA Weather Radio Station, 162.550 MHz, Santa Maria
CIMIS ETo information can be heard weekdays, March through October,
during the agricultural weather advisory report.

Santa Clara County

Station 69, Station 132
Santa Clara Valley Water District, Santa Clara
(408) 267-3127*

Santa Cruz County

Station 19, Station 104
Register Pajararian, Watsonville

Shasta County

NOAA Weather Radio Station, 162.550 MHz, Redding
CIMIS ETo information can be heard weekdays, March through October, during
the agricultural weather advisory report.

Solano County

Station 121, Station 122, Station 123
Solano Irrigation District/Maine Prairie Water District/Reclamation District 2068/
Natural Resources Conservation Service, Fairfield
(800) 897-7666*

Stanislaus County

Station 71
Modesto Irrigation District
(209) 526-7549*

Tehama County

Station 8
Corning Daily Observer, Corning
(530) 824-5464
Prints weekly ET for seven crops.

Station 8
Red Bluff Daily News, Red Bluff
(530) 527-2151
Prints weekly ET for seven crops weekly.

Tulare County

NOAA Weather Radio Station, 162.500, Lindsay
CIMIS ETo information can be heard weekdays, March through October,
during the agricultural weather advisory report.

Arizona

NOAA Weather Radio Station, 162.550, Yuma
CIMIS ETo information can be heard weekdays, March through October,
during the agricultural weather advisory report.

* Indicates recording.

Agencies That Provide CIMIS Recordings

Many water and irrigation districts access the CIMIS computer, retrieve evapotranspiration information, record, and provide a daily telephone recording of the data for access by their water users. Some of these agencies also calculate specific crop water use, record, and provide it for public access. This information can enable irrigators to manage water use more effectively for higher profits. Listed below are the names, addresses, and telephone numbers of key contacts and agencies.

AgLine Kings River Conservation District

4886 East Jesen Avenue
Fresno, California 93725
(559) 237-5567
Steve Haugen

Citrus Heights Water District/Fair Oaks Water District/ San Juan Water District/Orangevale Water Company

6230 Sylvan Road
Citrus Heights, California 95610
(916) 725-6873
Joe Scherrer

City of Santa Barbara

630 Garden Street
Post Office Box 1990
Santa Barbara, California 93102-1990
(805) 564-5460
Alison Whitney

Coachella Valley Water District

Post Office Box 1058
Coachella, California 92236
(760) 398-2651, Ext. 541
Dave Harbison

Contra Costa Water District

1331 Concord Avenue
Post Office Box H20
Concord, California 94524
(925) 688-8136
Chris Dundon

East Bay Municipal Utilities District

P.O. Box 24055 MS 48
Oakland, California 94623
(510) 287-1823
Dave Langridge and John Swindell

Eastern Municipal Water District

2045 San Jacinto Ave.
P.O. Box 8300
San Jacinto, California 92581-8300
(909) 925-7676 Ext. 4221
Ted Haring

Marin Municipal Water District

220 Nellen Avenue
Corte Madera, California 94925
(415) 945-1525, Ext. 365, Dave Irbarne

Mission Resource Conservation District

1181 East Mission Road
Fallbrook, California 92028
(760) 728-1332
Judy Mitchell

Modesto Irrigation District

P.O. Box 4060
Modesto, California 95352
(209) 526-7567
Dave Colby

Mojave Desert Resource Conservation District

18484 Highway 18, Suite 195
Apple Valley, California 92307
(760) 242-2906
Jakie Lindgren

North Marin Water District

999 Rush Creek Place
Post Office Box 146
Novato, California 94948
(415) 897-4133
Edie Robbins

Rancho California Water District

Post Office Box 9017
Temecula, California 92589-9017
(909) 676-4101
Don Peck

San Jacinto Basin RCD

711 W. Esplanade, Suite C
San Jacinto, California 92582
(909) 654-7733
Jim Gilmore

San Benito County Water District

Post Office Box 899
30 Mansfield Road
Hollister, California 95024
(831) 637-8218
Jeff Ray

Solano County

501 Texas Street
Fairfield, California 94533
(707) 421-6790 Larry Clement

U. C. Cooperative Extension, San Diego

5555 Overland Avenue
Building 4
San Diego, California 92123
(619) 694-2845
Gary Bender

Western Municipal Water District

450 Alessandro Boulevard
Riverside, California 92508
(909) 780-9764 Ext. 66
Steven Mains

Regional Access Points for CIMIS Information

Newspapers

Ag Alert (weekly)

California Farm Bureau Federation

1601 Exposition Boulevard

Sacramento, California 95815

(916) 924-4140

Stations 5, 7, 21, 30, 41, 49, 61, 62, 70, 89, 91, 120

Graphical presentation of ETo information for
Sacramento/San Joaquin Valley agricultural areas.

Web Sites

www.avoinfo.com/growers/cimiscalculator.shtml

www.ipm.ucdavis.edu/WEATHER/about_weather.html

www.waterright.org/site/reference/cimisdist.html

www.citrusresearch.com/sub/sub697/county.htm

www.fruitsandnuts.ucdavis.edu/weather/theservice.html

www.dpla.water.ca.gov/cimis.html

www.dpla.water.ca.gov/urban/wc.html

Many water agency web sites have CIMIS information.

CIMIS Alert

CIMIS Alert is a program sponsored by DWR to help public and private agencies provide a useful, cost-effective service to water users.

The CIMIS Alert program helps public agencies to establish a daily telephone recording of local evapotranspiration (ETo). Contact your local water agency and/or cooperative extension office to see if CIMIS ETo information is available.

Figure 5: CIMIS—Current & Historical Weather Station Sites

Sta #	Station Name	County	Start Date	End Date	Sta #	Station Name	County	Start Date	End Date
1	Fresno/F.S.U. USDA	Fresno	06/07/82	09/25/88	79	Angwin	Napa	05/11/89	12/27/96
2	Five Points/USDA	Fresno	06/07/82	—	80	Fresno State	Fresno	10/03/88	—
3	Beach/Santa Cruz CO	Santa Cruz	05/30/82	08/25/86	81	Shenandoah Valley	Amador	05/11/90	—
4	Webb/Santa Cruz CO	Santa Cruz	05/30/82	04/29/88	82	Claremont	Los Angeles	04/13/89	—
5	Shafter/USDA	Kern	06/01/82	—	83	Santa Rosa	Sonoma	02/11/89	—
6	Davis	Yolo	07/17/82	—	84	Browns Valley	Yuba	04/13/89	—
7	Firebaugh/Telles	Fresno	09/22/82	—	85	Hopland FS	Mendocino	09/23/89	—
8	Gerber	Tehama	09/22/82	—	86	Lindcove	Tulare	05/31/89	—
9	Lamont	Kern	09/29/82	04/10/89	87	Meloland	Imperial	12/12/89	—
10	Bakersfield/Greenlee	Kern	10/01/82	04/16/86	88	Cuyama	Santa Barbara	05/20/89	—
11	Bakersfield/Bonanza	Kern	09/29/82	04/17/86	89	Salinas South	Monterey	09/05/92	—
12	Durham	Butte	10/19/82	—	90	Alturas	Modoc	04/23/89	—
13	Camino	El Dorado	10/19/82	—	91	Tulelake FS	Siskiyou	04/12/89	—
14	Orland (inactive)	Glenn	10/30/82	04/21/87	92	Keatson	Merced	10/13/89	—
15	Stratford	Kings	10/29/82	—	93	Lamont	Kern	02/04/90	10/03/94
16	San Juan	Monterey	10/23/82	08/24/95	94	Goleta Foothills	Santa Barbara	07/07/90	—
17	El Centro	Imperial	11/08/82	05/27/87	95	Watsonville	Santa Cruz	09/13/89	07/24/95
18	Westmorland	Imperial	11/11/82	04/09/86	96	Woodside	Santa Mateo	10/31/90	01/24/94
19	Castroville	Monterey	11/18/82	—	97	Port Hueneme	Ventura	02/16/91	—
20	Corcoran	Kings	11/22/82	04/09/86	98	Ramona	San Diego	04/20/91	05/28/98
21	Kettleman	Kings	11/19/82	—	99	Santa Monica	Los Angeles	12/11/92	—
22	Caruthers	Kings	11/18/82	06/06/88	100	Fremont	Alameda	08/29/91	—
23	King City	Monterey	11/19/82	12/23/85	101	Piru	Ventura	08/27/91	—
24	Thermal (inactive)	Riverside	11/22/82	03/03/86	102	El Dorado	Los Angeles	10/24/90	10/20/99
25	Rancho Mirage	Riverside	11/22/82	11/20/85	103	Windsor	Sonoma	12/14/90	—
26	Lost Hills	Kern	11/29/82	08/13/86	104	De Laveaga	Santa Cruz	09/28/90	—
27	Zamora	Yolo	12/05/82	—	105	Westlands	Fresno	04/17/92	—
28	Soledad	Monterey	01/04/83	02/11/87	106	Sanel Valley	Mendocino	02/01/91	—
29	Cantua Creek	Fresno	01/02/83	07/23/85	107	Santa Barbara	Santa Barbara	04/07/93	—
30	Nicolaus	Sutter	01/03/83	—	108	Gerber Dryland	Tehama	03/11/91	05/12/98
31	McFarland/Kern Farms	Kern	01/11/83	03/08/93	109	Carneros	Napa	03/11/93	—
32	Colusa	Colusa	01/13/83	—	110	Newberry Springs	San Bernardino	02/21/92	12/27/96
33	Visalia/ICI Americas	Tulare	01/05/83	—	111	Green Valley Road	Santa Cruz	05/29/92	—
34	Rancho California	Riverside	01/21/83	11/25/86	112	San Ardo	Monterey	06/18/93	03/13/95
35	Bishop	Inyo	02/04/83	—	113	King City-Oasis Rd.	Monterey	06/12/93	—
36	Blythe	Riverside	03/13/83	08/12/88	114	Arroyo Seco	Monterey	06/18/93	—
37	Salinas	Monterey	04/11/83	07/27/92	115	Gonzales	Monterey	06/18/93	11/10/98
38	Santa Maria	Santa Barbara	05/03/83	04/27/99	116	Salinas North	Monterey	06/18/93	—
39	Parlier	Fresno	05/23/83	—	117	Victorville	San Bernardino	02/01/94	—
40	Mendota/Murietta USDA	Fresno	06/14/83	04/15/92	118	Cathedral City	Riverside	12/07/95	—
41	Calipatria/Mulberry	Imperial	07/17/83	—	120	Guadalupe	Santa Barbara	12/24/93	—
42	Lodi	San Joaquin	10/16/83	—	121	Dixon	Solano	09/20/94	—
43	Macarthur	Shasta	10/31/83	—	122	Hastings Tract	Solano	03/28/95	—
44	U.C. Riverside	Riverside	06/02/85	—	123	Suisun Valley	Solano	08/18/94	—
45	San Diego	San Diego	06/09/85	04/27/89	124	Panoche	Fresno	07/27/95	—
46	MacDoel	Siskiyou	11/11/85	06/11/86	125	Arvin-Edison	Kern	03/22/95	—
47	Brentwood	Contra Costa	11/18/85	—	126	San Benito	San Benito	06/09/94	—
48	Tulelake	Siskiyou	02/03/86	09/30/93	127	Salton Sea West	Imperial	11/21/94	—
49	Oceanside	San Diego	03/11/86	—	128	Salton Sea East	Imperial	11/17/94	—
50	Thermal	Riverside	07/22/86	01/11/99	129	Pajaro	Monterey	09/13/95	—
51	Healdsburg	Sonoma	08/24/86	03/28/94	130	Temecula East	Riverside	07/01/95	11/05/96
52	San Luis Obispo	San Luis Obispo	04/02/86	—	131	Fair Oaks	Sacramento	04/18/97	—
53	Greenfield	Monterey	10/10/86	10/23/91	132	Morgan Hill	Santa Clara	04/28/97	—
54	Blackwells Corner	Kern	10/19/86	—	133	Glendale	Los Angeles	08/07/96	—
55	Palm Desert	Riverside	05/26/87	04/11/94	134	Barstow NE	San Bernardino	01/08/97	—
56	Los Banos	Merced	06/28/88	—	135	Blythe NE	Riverside	01/16/97	—
57	Buntingville	Lassen	06/22/86	—	136	Oasis	Riverside	01/07/97	—
58	Santa Paula	Ventura	07/30/87	02/15/91	137	Temecula East II	Riverside	02/20/97	—
59	Tehachapi	Kern	07/29/86	08/23/90	138	Famoso	Kern	04/09/97	—
60	Barstow	San Bernardino	11/20/86	02/20/92	139	Winters	Solano	06/15/98	—
61	Orland	Glenn	05/13/87	—	140	Twitchell Island	Sacramento	10/08/97	—
62	Temecula	Riverside	11/25/86	—	141	Mecca	Riverside	05/05/98	—
63	Novato	Marin	07/01/86	—	142	Orange Cove	Fresno	01/01/99	—
64	Santa Ynez	Santa Barbara	11/21/86	—	143	San Juan Valley	San Benito	01/01/98	—
65	Walnut Creek	Contra Costa	07/22/87	—	145	Madera	Madera	05/13/98	—
66	San Diego	San Diego	04/27/89	—	146	Belridge	Kern	10/09/98	—
67	Goleta	Santa Barbara	02/17/88	04/07/93	147	Otay Lake	San Diego	04/15/99	—
68	Seeley	Imperial	05/29/87	—	148	Merced	Merced	01/04/99	—
69	San Jose	Santa Clara	06/08/87	—	149	Oakland Foothills	Alameda	03/25/99	—
70	Manteca	San Joaquin	11/12/87	—	150	Miramar	San Diego	04/23/99	—
71	Modesto	Stanislaus	06/25/87	—	151	Riverplex	Riverside	12/19/98	—
72	Palo Verde	Imperial	09/08/87	—	153	Escondido SPV	San Diego	02/01/99	—
73	Hollywood Hills	Los Angeles	03/04/88	09/14/93	154	Salton Sea North	Riverside	10/15/98	—
74	Escondido	San Diego	04/26/88	12/24/98	155	Bryte	Yolo	12/10/98	—
75	Irvine	Orange	10/07/87	—	159	Monrovia	Monrovia	10/15/99	—
76	Betteravia	Santa Barbara	12/18/87	07/01/93	161	Patterson	Patterson	08/23/99	—
77	Oakville	Napa	03/01/89	—	162	Indio	Indio	12/24/99	—
78	Pomona	Los Angeles	03/14/89	—					

Figure 6: CIMIS Station Locations



Further Information Sources

The following additional information sources can help those who have already established or are in the process of establishing a CIMIS-based irrigation system.

Irrigation Scheduling Software

Many different computer programs are available to help growers and landscape managers schedule irrigations. The following is a list of available irrigation scheduling computer programs and their compatibilities. This is not in any way an endorsement by the California Department of Water Resources of these programs, nor is it meant to be a complete list of available irrigation scheduling software.

addVANTAGE

Agricultural Irrigation & Soil
Moisture Monitoring
PC
Adcon Telemetry
3581 Westwind Blvd.
Santa Rosa, California 95403
(707) 522-2277
www.adcon.com

AGWATER

Examining On-Farm Water Management
(Diagnostic Tool)
PC
Cal Poly Irrigation Training and Research Center
San Luis Obispo, California 93407
(805) 756-2434
(805) 756-2433 Fax
www.itrc.org

BIS2

Irrigation Scheduling
PC
Richard Snyder
Biometeorologist
LAWR, Hoagland Hall
UC Davis
Davis, California 95616-8627
(530) 752-4628
(530) 752-1552 Fax

IREAD

Interactive Irrigation
Web
Peek Electronics Inc.
1316 Lymric Way
Bakersfield, CA 93309
(805) 833-3500
(805) 398-8027
pept@kern.com
www.theweatherpage.net

IRRICALC

Irrigation Scheduling, Peak Demand Analysis,
& Annual Water Use Estimating
PC, Mac
Software Republic
17171 Park Row, Suite 325
Houston, Texas 77084
(800) 348-3243
(281) 578-9440 Fax

Irrigation District Manager

Water Delivery Scheduling for Irrigation Districts
PC
Advance Information Systems
Post Office Box 95
Sumpter, Oregon 97877-0095
(541) 894-2465
www.advanceis.com

Irrigation Evaluation

Irrigation System Evaluation

PC
Cal Poly Irrigation Training and Research Center
San Luis Obispo, California 93407
(805) 756-2434
(805) 756-2433 Fax
www.itrc.org

JUDI

Downloading Software for CIMIS Data

PC, HP150
Orange Enterprises, Inc.
2377 West Shaw, Suite 205
Fresno, California 93711
(209) 229-2195
(209) 229-9348 Fax
www.orangesoftware.com

Landscape Water Manager

Landscaping Irrigation Scheduling

PC
Cal Poly Irrigation Training and Research Center
San Luis Obispo, California 93407
(805) 756-2434
(805) 756-2433 Fax
www.itrc.org

PLANTMASTER

Landscape Irrigation

PC, Mac
Acacia Software
2899 Agoura Road, Suite 652
West Lake Village, California 91361
(805) 499-9689
www.plantmaster.com

ROY

Irrigation Scheduling

PC, HP150
Orange Enterprise, Inc.
2377 West Shaw, Suite 205
Fresno, California 93711
(209) 229-2195
(209) 229-9348 Fax
www.orangesoftware.com

SAM

Soil Moisture Monitoring

PC, HP150
Orange Enterprise, Inc.
2377 West Shaw, Suite 205
Fresno, California 93711
(209) 229-2195
(209) 229-9348 Fax
www.orangesoftware.com

WATERIGHT

Irrigation Scheduling Tutorial

Web
Center for Irrigation Technology
California State University Fresno
Fresno, California 93740
(209) 278-2066
www.wateright.org

Irrigation Consultants

Many growers and landscape managers in California use irrigation consultants to help with irrigation scheduling. They are hired to conduct the required field work and analysis, and to advise on when to irrigate and how much water to apply. Consultants can also work with the grower or manager for a specified term to provide training on how to schedule irrigations using the consultants' computer programs (which must be purchased or leased from the consultant).

Listed on the following pages are consultants in California who offer services to growers or managers in evaluating and scheduling water budget irrigations. This list is not in any way an endorsement by the California Department of Water Resources of these consultants, nor is it meant to be a complete list of consultants offering these services. Any consultant who offers water budget irrigation scheduling services can be added to this list by writing to Department of Water Resources, Water Use Efficiency Office, Post Office Box 942836, Sacramento, California 94236-0001.

Agricultural and Environmental Resource Assessment

639 K Street
Davis, California 95616
(530) 758-8475

Agri-Valley Consulting

Chris Morgner

Post Office Box 3408
Merced, California 95344
(209) 722-7665
(209) 722-4370 Fax
CKJMorg@aol.com

Agro Industrial Management Irrigation & Soils Consultants

Farouk A. Hassan, Ph.D

Post Office Box 5632
Fresno, California 93755
(559) 224-1618
(559) 299-9384

AGWISE

Jarald Davidson

1770 Serenty Way
Chico, California 95928-6943
(916) 893-4520

Ag-Water Management

Andrew Hensel

3635 E. Platt
Fresno, California 93702
(559) 268-9158
(559) 268-9155 Fax

Anderson Associates International

Doug Anderson

2130 Brandage Lane
Bakersfield, California 93304
(805) 633-5400

Applied Water Management Services

John A. Basanese

1160 Arapaho Drive
Gilroy, California 95020
(408) 848-3649
AWMSVS@aol.com

AquaMetrics

Gary Kah

1114 Chesterton Ave.
Redwood City, California 94061
(650) 366-8076
(650) 429-2010 Fax
Gary_Kah@AquaMetrics.com

Britz Fertilizers, Inc.

Timothy E. Smith

Post Office Box 366
Five Points, California 93624
(209) 884-2421

California AgQuest

Ron Brase

4323 N. Golden State, Suite 101
Fresno, California 93722
(559) 275-8095
(559) 275-5301 Fax
RoneBrase@AgQuest.com

Cathcart/Begin Associated, Inc.

Harry Clarke

44 Plaza Square
Orange, California 92666
(714) 771-6673

Crop Care Associates, Inc.

Robert Gallagher

Post Office Box 2419
Yountville, California 94599
(707) 944-2998
(707) 275-6830 Fax

Dellavalle Laboratory, Inc.

1910 West McKinley, Suite 110
Fresno, California 93728
(559) 233-6129
soillab@aol.co

Dendron Landscape Management

Richard Reasoner

Post Office Box 855
Stinson Beach, California 94970
(415) 868-0479

Djegal Associates International

A. Djegal or Leona Djegal

705 Mandarin Lane
Walnut Creek, California 94598
(925) 934-0880
(925) 934-0880 Fax

Don K. Burns Irrigation Consultants, Inc.

1229 Roslyn Lane
La Jolla, California 92037
(619) 454-6433
(619) 456-9785 Fax

E. Domitz & Associates

Efraim Domitz

Post Office Box 3247
North Hollywood, California 91609
(818) 362-0292
(818) 362-9872 Fax

Environmental Water Management

Chris Willig

Post Office Box 1171
Agoura Hills, California 91301
(818) 889-6521
(818) 707-1509
ewaterm@aol.com

The Earth Laboratory, Inc.

**AquAudit Division, Landscape and
Water Management**

3100 Airway Avenue, Suite 110
Costa Mesa, California 92626-4604
(714) 513-9225
(714) 513-9230 Fax

Gabrielsen & Associates

Byron C. Gabrielsen, Ph.D, CCA

5921 W. Crowley Court
Visalia, California 93291
(559) 739-7442
(559) 739-7442 Fax

Gardeners' Guild, Inc.

27 Larkspur Street
San Rafael, California 94901
(415) 457-0400

Gary Motshagen, CID, CLIA, or

Gregory Motshagen, CLIA

G.L. Motshagen Associates, Ltd.

711 West 27th Street, Suite G-9
Costa Mesa, California 92627
(714) 722-2967
(714) 722-0567 Fax

Gordon's Irrigation Consulting, a Corp.

Roger Gordon or Wes Hall

23011 Moulton Parkway, Suite D-11
Post Office Box 2008
Laguna Hills, California 92653
(714) 770-2910
(714) 458-2393 Fax

Greenmark Landscape Management

Marj J. Derhak

74-940 Highway 111, Suite 105
Indian Wells, California 92210-7111
(888) 833-3710
(888) 833-3710 Fax
greenmrk@msn.com

The Growing Concern

Post Office Box 10391
Fullerton, California 92635
(714) 738-3623

Hannesson & Associates

John Hannesson

1301 Drake Drive
Davis, California 95616
(530) 756-4694

Integrated Urban Forestry, Inc.**Mr. Tom Larson, President**

23441 South Pointe Dr., Suite 150
Laguna Hills, California 92653
(714) 837-5692
(714) 837-5834 Fax

Irrigation Consultant & Evaluation**Mike Conner, CLIA**

1203 Champion Oaks Dr.
Roseville, California 95661
(916) 772-2226
(916) 772-2226 Fax

Irrigation Hawaii**Allan G. Schildknecht**

Post Office Box 549A
Kaaawa, Hawaii 96730
(808) 247-7777
(808) 247-0118 Fax

Irrigation Management Group (IMG)**John E. Blevens**

4 Union Square, Suite E
Union City, California 94587
(510) 471-2544
(800) 421-2600
(510) 471-6257 Fax

Irrigation Water Management Group**Rick Phenicie, CIA**

1451 S. Rimpau Ave., Suite 102-112
Corona, California 91719
(909) 777-0616
(909) 491-6038 Fax

JMLord

267 North Fulton
Fresno, California 93701
(559) 268-9755

Landscape Irrigation Consulting**Frank Simon**

2101 East Coast Highway, Suite 215
Post Office Box 368
Corona Del Mar, California 92625
(714) 759-7533
(714) 759-7615 Fax

Landscape Water Management**Chris Dundon**

716 Elsie Ave.
San Leandro, California 94577
(510) 614-9760

LARC Associates**Landscape Irrigation Consultants**

31475 Lobo Canyon Road
Agoura, California 91301
(818) 706-1018

Nakae & Associates, Inc.**Scott A. Kyle**

22693 Glenwood Drive
Aliso Viejo, California 92656
(949) 362-0405
(949) 362-2585 Fax

Pacific Agronomics, Inc.

3435 West Shaw, #104
Fresno, California 93711
(559) 276-0401

Pacific Green Landscape Architecture**Gregg Polubinsky, MLA**

Post Office Box 344
Watsonville, California 95077
(408) 662-9412
(408) 685-8353 Fax
larch@pacificgreen.com

Phytosphere Research**Ted Swiecki, Ph.D.**

1027 Davis Street
Vacaville, California 95687
(707) 452-8735
(707) 452-8735 Fax

Pierre Charles Landscape Construction**Martine Charles**

Post Office Box 6778
Laguna Niguel, California 92607
(714) 489-9825
(714) 489-9826 Fax

Rain for Rent

Highway 101, 3 Miles South
Post Office Box 1968
Salinas, California 93902
(408) 422-7813

Russell D. Mitchell & Associates, Inc.**Russell D. Mitchell**

2760 Camino Diablo
Walnut Creek, California 94596
(925) 925-3985

Scaliter Irrigation Engineering, Inc.

Dan Scaliter

902 Aaron Drive
Redlands, California 92374
(714) 794-5811
(714) 794-5873 Fax

Simplot Soilbuilders

Lora Pankey

Post Office Box 198
Lathrop, California 95330
(209) 858-6464
lpankey@simplot.com

Stoddard & Associates

Hafiz Munir

1120 West I Street, Suite C
Los Banos, California 93635
(209) 826-5155
(209) 826-3307 Fax

TurfTech Industries

Michael Wesner or Brian Barklage

919 Manhattan Avenue, #F100
Manhattan Beach, California 90266
(310) 379-2701
MAWesnerJr@aol.com

Water and Landscape Consultants

Randall Ismay

24002 Estacia Ave.
Laguna Niguel, CA 92677-2213
(714) 495-5819
(714) 495-8534 Fax

Water Management Group

2200 Business Way, Suite 100
Riverside, CA 92501
(909) 788-8497
(909) 788-8538 Fax

Water Management Services

Raymond Sanders

2422 N. French Street
Santa Ana, CA 92706
(714) 547-7481
(714) 583-6801 Fax

Water Wise Systems

Mike Schmitt

2087-20 N. Lopez Canyon Road
San Fernando, CA 91342
(818) 897-9900

Water Wise Systems

Doug Lape

825 Mabury Road
San Jose, CA 95133
(408) 453-5904

Water Wise Systems

Jay Gray

1960 South Yale Street
Santa Ana, CA 92704
(714) 546-7843

Xeris Technologies

John Curry

445 Fenmore
Barstow, California 92311
(619) 252-8141

Public Agency Assistance Department of Water Resources CIMIS Personnel

DWR Sacramento Headquarters:

Water Use Efficiency Office
1020 Ninth Street, Third Floor
Sacramento, California 95814

Baryohay Davidoff, Chief
California Irrigation Management Unit
CIMIS Project Manager
(916) 327-1788
(916) 327-1815 Fax
baryohay@water.ca.gov

Simon Eching
CIMIS Program Development and Outreach
(916) 327-1836
(916) 327-1815 Fax
seching@water.ca.gov

David Moellenberndt
CIMIS Weather Station Network and Data Quality Control
(916) 327-1792
(916) 327-1815 Fax
davidm@water.ca.gov

Northern Sacramento Valley Northeastern Stations:

Eugene Pixley
DWR Northern District
2440 Main Street
Red Bluff, California 96080-2398
(916) 529-7392
(916) 529-7322 Fax
pixley@water.ca.gov

Southern Sacramento Valley, Northern San Joaquin Valley and Bay Area Stations:

Mark Rivera
DWR Central District
3251 S Street
Sacramento, California 95816-7017
(916) 227-7603
(916) 227-7600 Fax
mrivera @ water.ca.gov

Central and Southern San Joaquin Valley and Monterey Bay Area Stations:

Kent Frame
DWR San Joaquin District
3374 East Shields Avenue
Fresno, California 93726
(559) 230-3334
(209) 230-3301 Fax
kframe@water.ca.gov

Southern Coast and Desert Areas:

Sergio Fierro
DWR Southern District
770 Fairmont Avenue
Glendale, California 91203-1035
(818) 543-4652
(818) 543-4604 Fax
sergiof@water.ca.gov

CIMIS Help Line:

1-800-922-4647

Cooperative Extension County Offices

Alameda

UCCE Alameda County
1331 Harbor Bay Parkway, Suite 131
Alameda, California 94502
(510) 567-6812
(510) 567-6813 Fax

West Oakland
700 Adeline Street
Oakland, California 94607

Amador

108 Court Street
Jackson, California 95642-2379
Location:
12380 Airport Road
Martell, California 95654
(209) 223-6482
(209) 223-3279 Fax

Butte

2279B Del Oro Avenue
Oroville, California 95965
(530) 538-7201
(530) 538-7140 Fax

Calaveras

891 Mountain Ranch Road, County Annex
Government Center
San Andreas, California 95249-9709
(209) 754-6477
(209) 754-6472 Fax

Colusa

Post Office Box 180
100 Sunrise Boulevard, Suite E
Colusa, California 95932
(530) 458-0577
(530) 458-4625 Fax

Contra Costa

75 Santa Barbara Road, Second Floor
Pleasant Hill, California 94523-4488
(925) 646-6540
(925) 646-6708 Fax

El Dorado

311 Fair Lane
Placerville, California 95667-4195
(530) 621-5502
(530) 642-0803 Fax

Fresno

1720 South Maple Avenue
Fresno, California 93702
(559) 456-7285
(559) 456-7575 Fax

Glenn

Post Office Box 697
Road 200 E
Orland, California 95963
(916) 865-1107
(916) 865-1105 Fax

Humboldt-Del Norte

Ag Center Building
5630 South Broadway
Eureka, California 95503-6998
(707) 445-7351
(707) 444-9334 Fax

Del Norte Office
Court House Annex
981 H Street, Room 2
Crescent City, California 95531
(707) 464-4711
(707) 464-7520 Fax

Hoopa Valley Indian Reservation
Post Office Box 417
(Fishers Dept)
Hoopa, California 95546
(916) 625-4268, Ext 7

Imperial

1050 East Holton Road
Holville, California 92250-9615
(760) 352-9474
(760) 352-0846 Fax

Inyo-Mono

207 West S Street
Bishop, California 93514
(760) 873-7854
(760) 872-1610 Fax

Kern

1031 South Mt. Vernon Avenue
Bakersfield, California 93307
(805) 868-6200
(805) 868-6208 Fax

Kings

680 North Campus Drive, Suite A
Hanford, California 93230
(559) 582-3211, ext. 2730
(559) 582-5166 Fax

Lake

Ag Center
883 Lakeport Boulevard
Lakeport, California 95453
(707) 263-6838
(707) 263-3963 Fax

Lassen

UCCE Lassen County
707 Nevada Street
Susanville, California 96130
(916) 251-8132
(916) 257-6129 Fax

Los Angeles

UCCE Los Angeles County
2 Coral Circle
Monterey Park, California 91755
(213) 838-8330
(213) 838-7449 Fax

Antelope Valley Office
335A E Avenue K6
Lancaster, California 93535
(805) 723-4477
(805) 723-3751 Fax

Madera

328 Madera Avenue
(Location: SW Corner of Madera
Avenue & Lewis Street)
Madera, California 93637
(559) 675-7879
(559) 675-0639 Fax

Marin

1682 Novato Boulevard, Suite 150B
Novato, California 94947-7021
(415) 499-4204
(415) 499-4209 Fax

Mariposa

5009 Fairgrounds Road
(County Agricultural Commissioner's Office)
Mariposa, California 95338-9435
(209) 966-2417
(209) 966-2056 Fax

Mendocino

Ag Center/Courthouse
579 Low Gap Road
Ukiah, California 95482
(707) 463-4495
(707) 463-4477 Fax

Merced

2145 West Wardrobe Avenue
Merced, California 95340
(209) 385-7403
(209) 722-8856 Fax

Modoc

202 West 4th Street
Alturas, California 96101
(530) 233-6400
(530) 233-3840 Fax

Intermountain Research
& Extension Center
Post Office Box 850
Tulelake, California 96134
(530) 667-2719
(530) 667-5265 Fax

Monterey

1432 Abbott Avenue
Salinas, California 93901
(831) 759-7350
(831) 758-3018 Fax

King City Office
522 North 2nd Street
King City, California 93930
(831) 385-3618
(831) 385-0551 Fax

Napa

1710 Soscol Avenue, Suite 4
Napa, California 94559-1315
(707) 253-4221
(707) 253-4434 Fax

Orange

1045 Arlington Drive
Costa Mesa, California 92626
(714) 708-1606
(714) 708-2754 Fax

Placer-Nevada

DeWitt Center
11477 E Avenue
Auburn, California 95603
(530) 889-7385
(530) 889-7397 Fax

Nevada County Office
Veterans Memorial Building
255 South Auburn Street
Grass Valley, California 95945
(530) 273-4563
(530) 273-4769 Fax

Plumas-Sierra

208 Fairgrounds Road
Quincy, California 95971
(530) 283-6270
(530) 283-4210 Fax

Riverside

21150 Box Springs Road
Moreno Valley, California 92557-8718
(909) 683-6491
(909) 788-2615 Fax

Indio Office
46209 Oasis Street, Room 118
Indio, California 92201-5951
(760) 863-8293
(760) 775-0600 Fax

Palo Verde Office
290 North Broadway
Blythe, California 92225-1649
(760) 921-7884
(760) 921-2887 Fax

Sacramento

4145 Branch Center Road
Sacramento, California 95827-3898
(916) 875-6913
(916) 875-6233 Fax

San Benito

649A San Benito Street
Hollister, California 95023
(831) 637-5346
(831) 637-7111 Fax

San Bernardino

777 East Rialto Avenue
San Bernardino, California 92415-0730
(909) 387-2171
(909) 387-3306 Fax

San Diego

5555 Overland Avenue, Building 4
San Diego, California 92123-1219
(619) 694-2845 (General)
(619) 694-2860 (Master Gardener)
(619) 694-2861 (4-H)
(619) 694-2849 Fax
(619) 571-4225 TDD

San Joaquin

420 South Wilson Way
Stockton, California 95205-6299
(209) 468-2085
(209) 462-5181 Fax

San Luis Obispo

2156 Sierra Way, Suite C
San Luis Obispo, California 93401
(805) 781-5940

Paso Robles Office
1734 Paso Robles Street
Paso Robles, California 93446
(805) 237-3100
(805) 237-3088 Fax

San Mateo-San Francisco

San Mateo County Office
625 Miramontes Street, Suite 200
Half Moon Bay, California 94019-1945
(650) 726-9059
(650) 726-9267 Fax

San Francisco County Office
300 Piedmont Avenue
Building C, Room 305A
San Bruno, California 94066-3959
(650) 871-7559
(650) 871-7399 Fax

Elkus Youth Ranch
1500 Purisima Creek Road
Mail to:
625 Miramontes St., Suite 200
Half Moon Bay, California 94019
(650) 712-3158
(650) 712-3158 Fax
(650) 726-9059
(650) 726-9267 Fax

Santa Barbara

Santa Maria Office
Tech Service Building
624 West Foster Road, Suite A
Santa Maria, California 93455
(805) 934-6240
(805) 934-6333 Fax

UCCE Santa Barbara Office
105 E. Anapamu Street, Suite 5
Santa Barbara, California 93101
(805) 568-3330

Santa Clara

1005 Timothy Dr.
San Jose, California 95133
(408) 299-2635
(408) 298-5160 Fax

Santa Cruz

1432 Freedom Boulevard
Watsonville, California 95076-2796
(831) 763-8040
(831) 763-8006 Fax

Shasta-Trinity

1851 Hartnell Ave.
Redding, California 96002-2217
(530) 224-4900
(530) 224-4904 Fax

Shasta-Lassen Office
Post Office Box 9
Intermountain Fairgrounds
First & Grove Street
McArthur, California 96056-0009
(530) 336-5784
(530) 336-6845 Fax

Trinity Office
Post Office Box 490
Fairgrounds
Hayfork, California 96041
(530) 628-5495
(530) 628-4171 Fax

Siskiyou

1655 South Main Street
Yreka, California 96097
(530) 842-6931
(530) 842-2711 Fax

Solano

2000 West Texas Street
Fairfield, California 94533-4498
(707) 421-6790
(707) 429-5532 Fax

Sonoma

2604 Ventura Avenue, Room 100-P
(City Administration Center)
Santa Rosa, California 95403-2894
(707) 527-2621
(707) 527-2623 Fax

Stanislaus

3800 Cornucopia Way, Suite A
Modesto, California 95358
(209) 525-6654
(209) 525-4969 Fax

Sutter-Yuba

142A Garden Highway
Yuba City, California 95991
(530) 741-7515
(530) 673-5368 Fax
1-800-698-4544 TDD

Tehama

Post Office Box 370
1754 Walnut Street
Red Bluff, California 96080
(916) 527-3101
(916) 527-0917 Fax

Tulare

Ag Building, County Civic Center
2500 W. Burrel Avenue
(Corner of Woodland Drive and West Main)
Visalia, California 93291-4584
(559) 733-6363 (General)
(559) 733-6456 (Expanded Food and
Nutrition Education Program)
(559) 733-6401 (4-H)
(559) 733-6720 Fax

Tuolumne

2 South Green Street
Sonora, California 95370
(209) 533-5695
(209) 532-8978 Fax

Ventura

669 County Square Drive, Suite 100
Ventura, California 93003-5401
(805) 645-1451 (General)
(805) 645-1470 (4-H)
(805) 645-1468 TDD
(805) 645-1474 Fax

Yolo

70 Cottonwood Street
Woodland, California 95695-2593
(530) 666-8143
(530) 666-8736 Fax

California Mobile Irrigation Laboratories

Although CIMIS helps irrigators develop water budgets to determine when to irrigate and how much water to apply, in order to have an efficient irrigation schedule the grower or landscape manager must know the performance of the irrigation system. Mobile laboratories measure water application rates and system distribution uniformity and give recommendations for irrigation system improvement if necessary. Mobile laboratory services are provided by a variety of public agencies. Similar services are also provided by some consultants. Listed below are the mobile labs and team leaders in California.

Kern County

Brian Hockett
c/o Pond-Shafter-Wasco Resource Conservation District
1601 New Stine Road, Suite 270
Bakersfield, California 93309
(805) 861-4129
(805) 861-4333 Fax
brian.hockett@ca.usda.gov

Kings County

John Weddington
c/o Kings River Conservation District
4886 East Jensen
Fresno, California 93725
(559) 237-5567
(559) 237-5560 Fax

Riverside County

Don Ackley
c/o Coachella Valley Resource Conservation District
80-975 Indio Boulevard, Suite B-11
Indio, California 92201
(760) 347-7658
(760) 347-4967 Fax

Jim Gilmore
c/o San Jacinto Basin Resource Conservation District
711 W. Esplanade Avenue, Suite C
San Jacinto, California 92383
(909) 654-7733
(909) 654-3157 Fax

Kerwin Russell
c/o Riverside-Corona Resource Conservation District
1299 Colombia Avenue, Suite E-5
Riverside, California 92507
(909) 683-7691
(909) 683-3814 Fax
rccrd@earthlink.net

San Diego County

Connie Chai, Andrea Souther
c/o Mission Resource Conservation District/Eco Lab
1181 East Mission Road
Fallbrook, California 92028
(760) 728-1332
(760) 728-1332 Fax
missnrcd@tfb.com

Santa Barbara County

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Santa Clara County

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(408) 265-2607, Ext. 2291
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Publications

Basic Irrigation Scheduling (Leaflet 21199)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

BMP 5 Handbook: A Guide to Implementing Large Landscape Conservation Programs as Specified in Best Management Practices

The California Urban Water Conservation Council
455 Capitol Mall, Suite 703
Sacramento, California 95814
(916) 552-5885

CIMIS ETo Zone Map

Water Use Efficiency Office
1020 Ninth Street
Sacramento, California 95814
(916) 327-1675

CIMIS: Fifteen Years of Growth and a Promising Future

CA Department of Water Resources
Bulletins and Reports
Post Office Box 942836
Sacramento, California 94236-0001
(916) 653-1097

Crop Water Use in California, Bulletin 113-4

CA Department of Water Resources
Bulletins and Reports
Post Office Box 942836
Sacramento, California 94236-0001
(916) 653-1097

Determining Daily Reference Evapotranspiration (ET_o), Rev. 1992 (Leaflet 21426)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Does Drip (and Other Low-Flow) Irrigation Save Water? 1984 (Leaflet 21380)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Drip Irrigation Management, 1981 (Leaflet 21259)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Drought Tips: 92-16 Leaching

California Department of Water Resources
Bulletins and Reports
Post Office Box 942836
Sacramento, California 94236-0001
(916) 653-1097

Drought Tips: 92-20 Water Balance Irrigation Scheduling Using CIMIS Eto

California Department of Water Resources
Bulletin and Reports
Post Office Box 942836
Sacramento, California 94236-0001
(916) 653-1097

Drought Tips: 92-29 Irrigation Management Made Simple

California Department of Water Resources
Bulletin and Reports
Post Office Box 942836
Sacramento, California 94236-0001
(916) 653-1097

Drought Tips: 92-38 Field Use of Tensiometers

California Department of Water Resources
Bulletins and Reports
Post Office Box 942836
Sacramento, California 94236-0001
(916) 653-1097

Drought Tips: 92-52 Irrigating Up Crops Efficiently With Sprinklers

California Department of Water Resources
Bulletins and Reports
Post Office Box 942836
Sacramento, California 94236-0001
(916) 653-1097

Drought Tolerant Ornamental Plants for the Coachella Valley

Coachella Valley Resource Conservation District
80-975 Indio Blvd., #B-11
Indio, California 92201
(760) 347-7658

Effectively Irrigating Landscape Trees

UC Cooperative Extension
San Bernardino County
777 East Rialto Avenue
San Bernadinio, California 92415
(909) 387-2171

Effluent Water for Turfgrass Irrigation, 1991 (Leaflet 21500)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Estimating Water Requirements of Landscape Plantings: The Landscape Coefficient Method, 1991 (Leaflet 21493)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Evaluating Turfgrass Sprinkler Irrigation Systems, 1992 (Leaflet 21503)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Five-year Research Findings on Water Efficient Ornamental Plants for the Coachella Valley

Coachella Valley Resource Conservation District
80-975 Indio Blvd., #B-11
Indio, California 92201
(760) 347-7658

Irrigation Management Priorities

UC Cooperative Extension
San Bernadino County
777 East Rialto Avenue
San Bernadino, California 92415
(909) 387-2171

Landscapes Southern California Style

Western Municipal Water District/ Cooperative Extension
450 E. Alessandro Boulevard
Post Office Box 5286
Riverside, California 92517-5286
(909) 789-4170

Landscapes Southern California Style: Plant List

Western Municipal Water District/ Cooperative Extension
450 E. Alessandro Boulevard
Post Office Box 5286
Riverside, California 92517-5286
(909) 789-4170

**Lawn Watering Requirements along California's Central Coast, 1987
(Leaflet 21432)**

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Managing Turfgrasses During Drought, 1991 (Leaflet 21499)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

San Diego Home/ Garden Magazine

San Diego County Water Authority
3211 Fifth Avenue
San Diego, California 92103
(619) 682-4152

Technical Elements of CIMIS

Water Use Efficiency Office
1020 Ninth Street
Sacramento, California 95814
(916) 327-1675

**Ten-Year Research Findings on Water-Efficient Ornamental Plants for the
Coachella Valley**

Coachella Valley Resource Conservation District
80-975 Indio Blvd., #B-11
Indio, California 92201
(760) 347-7658

Trees for Saving Energy, 1991 (Leaflet 21485)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Turfgrass Evapotranspiration Map: The Central Coast of California (Leaflet 21491)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Turfgrass Irrigation Scheduling, 1991 (Leaflet 21492)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Using Reference Evapotranspiration (ET_o) and Crop Coefficients to Estimate Crop Evapotranspiration (ET_c): (Agronomic Crops, Grasses, and Vegetable Crops) 1987 (Leaflet 21427)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Using Reference Evapotranspiration (ET_o) and Crop Coefficients to Estimate Crop Evapotranspiration (ET_c): Trees and Vines, 1987 (Leaflet 21428)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Watering Lawns Along California's South Coast (Leaflet 21347)

Cooperative Extension
Agricultural Information and Publications
University of California
University Services Building, Room 110
1441 Research Park Drive
Davis, California 95616
(530) 757-8930

Water Use Classification of Landscape Species (WUCOLS III)

Water Use Efficiency Office
1020 Ninth Street
Sacramento, California 95814
(916) 327-1675

Training Information

Many public and private agencies offer either training classes, seminars, or workshops on different aspects of irrigation and irrigation scheduling. The Irrigation Training and Research Center at California Polytechnic State University, San Luis Obispo, and the Center for Irrigation Technology at California State University at Fresno are the two main institutions that offer this training on a regular basis. Also check with your county Cooperative Extension Office and Soil Conservation Office for workshops in your area. The addresses and telephone numbers of Cooperative Extension Offices are listed at the beginning of this section.

AGWATER

This is an interactive learning/teaching computer program regarding agricultural irrigation. It combines irrigation scheduling and distribution uniformity concepts.

For information on class schedules and fees, contact the Irrigation Training and Research Center at Agricultural Engineering Department, Cal Poly State University, San Luis Obispo, California 93407; (805) 756-2434.

Irrigation Evaluation Short Course

This two and one-half day short course is offered twice per year. It combines classroom (35 percent) and outdoor laboratory (65 percent) activities. The course is not mathematically oriented, and emphasizes philosophy and technique of evaluation, ranging from how to take a pressure measurement to what specific measurements are needed for evaluation of each distinct irrigation method (furrow, border strip, hand move/side roll sprinklers, linear move sprinkler, undertree sprinkler, and microirrigation). The techniques and program follow the standards used for DWR-funded evaluation projects throughout California.

For information on class schedules and fees, contact the Irrigation Training and Research Center at Agricultural Engineering Department, Cal Poly State University, San Luis Obispo, California 93407; (805) 756-2434.

Designer/Manager School of Irrigation

The Designer/Manager School is a comprehensive educational program which offers a variety of classes designed for both agricultural and landscape irrigation professionals. The classes are designed so that participants receive practical information on key irrigation design management concepts. This allows them to prepare for the Irrigation Association Certification Exams and to receive PCA and CCA continuing education credits.

For information on class schedules and fees, contact the Irrigation Training and Research Center at Agricultural Engineering Department, Cal Poly State University, San Luis Obispo, California 93407; (805) 756-2434.

Center for Irrigation Technology CSU, Fresno

CIT seminars and workshops serve as a forum for developing and demonstrating effective water management systems and practices. They are also used to disseminate information to

the public. These seminars and workshops cover basic irrigation scheduling, water auditing, system maintenance procedure, hands-on and computer-simulated irrigation systems, and other related topics. Theory is integrated with practice.

For information, contact CIT at California State University, Fresno, California 93740-0013; (559) 278-2066.

Bilingual Training Institute (BTI)

BTI's mission is to improve water management practices, plant performance and proper use of irrigation equipment in both the landscape and agricultural industries, by educating field employee in both English and Spanish.

To accomplish this goal, BTI works in close cooperation with maintenance companies, growers, irrigation equipment and fertilizer manufacturers, government agencies and educators.

BTI irrigation system operation and maintenance classes include plant-soil-water relations, irrigation system adjustment and repairs, irrigation system troubleshooting, controller programming, practical techniques for irrigation scheduling, and basic hydraulics for system troubleshooting.

For more information, contact Toni Monzon, BTI, 1275 E. Walnut Ave., Orange, CA 92667; (714) 289-8815.

Glossary of CIMIS Terms

Air Temperature

Temperature of air surrounding a CIMIS weather station. It is measured at 1.5 meters above the grass-covered ground and in the shade.

Anemometer

Instrument used to measure wind speed.

Applied Water Demand

Amount of water needed to meet the demand of the user.

Atmospheric Pressure

The pressure exerted by the weight of air above a given point.

Average (Value)

The arithmetic mean of a set of values.

Celsius Temperature Scale (° C)

A temperature scale on which the freezing point of water equals 0 degrees and the boiling point equals 100 degrees at standard atmospheric pressure (29.9 inches or 760 millimeters of mercury).

Crop Coefficient

A conversion factor used to convert ETo (see Reference Evapotranspiration) to a particular crop evapotranspiration.

Dew Point (Temperature)

The temperature to which air must be cooled (at constant pressure and constant water vapor content) for saturation to occur. When dew point is equal to air temperature, Relative Humidity equals 100 percent.

Distribution Uniformity

The ratio of the average low-quarter depth of irrigation to the average depth of irrigation for the whole field, expressed as a percent.

ET

See evapotranspiration.

ETo

See "Reference Evapotranspiration (ETo)."

Evaporation

The process by which a liquid changes into a gas.

Evapotranspiration

The combined processes by which water is transferred from the soil surface and from a plant (from the leaf surface and through leaf pores) to the atmosphere (ambient air). Symbolized as ET.

Fahrenheit (° F)

A temperature scale on which the freezing point of water equals 32 degrees and the boiling point equals 212 degrees at standard atmospheric pressure (29.9 inches or 760 millimeters of mercury).

Humidity

A term that refers to water vapor content in the air.

Irrigation Efficiency

The efficiency of water application and use, calculated by dividing a portion of applied water that is beneficially used by the total applied water, expressed as a percentage.

Modem

A device used to process a data signal in order that it can be transmitted over the telephone line. For example, data from the CIMIS computer is transmitted to CIMIS users' microcomputer via modem.

Net Radiation

The difference in the amount of incoming radiation and the amount of radiation returning from the surface (also see "Solar Radiation").

Precipitation

All forms of water particles, liquid or solid, that fall from the atmosphere and reach the surface.

Precipitation (Rain) Gauge

Instrument used to measure the amount of precipitation. It is measured at one meter (39 inches) above the ground surface.

Pyranometer

Instrument used to measure solar radiation.

Reference Evapotranspiration (ET_o)

The rate of evapotranspiration from tall, cool-season green-grass of uniform height (4 to 6 inches–10 to 15 cm-tall), completely shading the ground, and not short of water.

Relative Humidity (RH)

A measurement of the amount of moisture in the atmosphere. It is the ratio of actual Vapor Pressure to Saturation Vapor Pressure over a flat surface of water. Symbolized as RH.

Resultant Wind

The result of the mean wind speed and the mean wind direction over a given period.

Saturation Vapor Pressure

Pressure (force per unit area) exerted by water vapor in moist air if the air is "saturated" with respect to a flat surface of water.

Sensor

An instrument that measures meteorological variable (e.g., temperature) in the form of an electronic signal which is then converted to a digital value.

Soil Temperature

Temperature of the soil measured at a depth of 6 inches (15 centimeters) at CIMIS weather stations, under a grass-covered soil surface.

Solar Radiation

The heat, or energy, given out by the sun that is received on the earth surface.

Station

A group of sensors that measure and record meteorological data. Recorded data is either retrieved remotely or on site.

Vapor Pressure

The pressure (force per unit area) exerted by water vapor in moist air.

Wind Direction

The direction from which the wind is blowing.

Wind Gust

Refers to a peak wind speed.

Wind Magnitude

See "Resultant Wind."

Wind Run

The velocity of the wind measured in distance over time on a daily basis. Example: miles per day (mpd).

Wind Speed

The rate at which wind blows measured in distance over time. Example: miles per hour (mph).